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IN THE UNITED STATES PATENT & TRADEMARK OFFICE

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IN RE APPLICATION OF :  
DOMINIQUE LOUBINOX : EXAMINER: AFTERGUT, J.  
SERIAL NO: 10/068,857 :  
FILED: FEBRUARY 11, 2002 : GROUP ART UNIT: 1791  
FOR: METHOD AND APPARATUS FOR :  
THE MANUFACTURE OF COMPOSITE  
SHEETS

REPLY BRIEF UNDER 37 C.F.R. §41.41

COMMISSIONER FOR PATENTS  
ALEXANDRIA, VIRGINIA 22313

SIR:

Responsive to the Examiner's Answer of June 24, 2008, Appellants submit the present Reply Brief including the remarks below in rebuttal.

III. STATUS OF THE CLAIMS

Claims 30-31, 44, 47, 52 and 54-59 are pending in the application. Claims 1-29, 32-43, 45-46, 48-51 and 53 are canceled claims. The rejection of Claims 30-31, 44, 47, 52 and 54-59 is appealed.

VI. GROUND OF REJECTION

The grounds of rejection are set forth in the Appeal Brief filed on May 27, 2008 (see pages 2-3) and the Examiner's Answer of June 24, 2008 (see pages 4-10). The Grounds of Rejection of the May 27, 2008 Appeal brief are reproduced below.

- A. **Claims 30-31, 44, 47, 52 and 54-59 are rejected as obvious under the meaning 35 U.S.C. §103(a) over Middelman (US 5,269,863) in combination with one or more of O'Connor (US 4,800,113); NASA ("Solventless Fabrication of Reinforced Composites"); Curzio (US 4,539,249); U.K. Patent 2,190,041 (UK '041); Vane (US 4,445,693); and Matsuo (US 5,989,710) (see section no. 2 on pages 2-7 of the Office Action of July 13, 2006).**

The Office cites Middelman as a primary reference for describing a method for making a composite sheet that includes providing and combining different bundles of thread and impregnating the combined bundles with a matrix. The Office combines Middelman with one or more secondary references from the group of O'Connor, NASA, Curzio, UK '041, Vane and Matsuo for the description of the use of a thread that includes a blend of thermoplastic organic fiber and a reinforcing fiber to avoid the disadvantages of the impregnation step described in the primary reference (see the paragraph bridging pages 3 and 4 of the Office Action of August 27, 2007). The Office asserts that it would be obvious to modify Middelman in the manner taught by the secondary references to arrive at the presently claimed invention.

## VII. ARGUMENT

The Examiner responded to Appellant's May 27, 2008 Appeal Brief by again asserting that the claimed method is obvious because it would be obvious to use the thermoplastic fiber of one or more of the cited secondary references (e.g., O'Connor, NASA Tech Brief, U.K. Patent 2,190,041, Curzio, Matsuo, and/or Vane) in the process of the primary reference (i.e., Middelman (U.S. 5,269,863)). See section 10, pages 10-13 of the Examiner's Answer. Appellants submit that the Examiner fails to give proper weight to the teachings of the cited references as they relate to the difficulties with which one of ordinary skill would be faced with when making the asserted modification to the process of Middelman.

Appellants submit that the references relied on by the Examiner as a basis for rejecting the claimed method as obvious would not be combined in the manner asserted by the Examiner because doing so is contrary to the express teachings of the references.

At the outset, it should be noted that the method of Claim 30 results in the manufacture of a composite sheet having the structure defined by the claim language. The composite sheet formed by the presently claimed method contains solely three layers (i.e., see the last two lines of Claim 30 which require “the composite sheet comprises solely the first bundle of parallel threads, the lap of threads, and the second bundle of parallel threads”). Equally important is the requirement of Claim 30 that “the threads of the first layer, second layer and third layer are separate and unconnected from threads in any other layer”.

The fiber structures used and/or formed in the secondary references cited by the Examiner are complex structures that include interwoven layers of thread that impart fabric-like properties to the fibers. The fabric-like properties of the fibers of the cited art are the basis for making the inventions disclosed in the cited art useful.

For example, UK '041 discloses the following:

The incorporation, according to this invention, of the polyaryletherketone in the form of fabric members (preferably of less than 150 micrometers diameter) into a fabric together with the reinforcing fabric members improves the uniformity of consolidation, and takes advantage of the desirable draping and “give” characteristics of a fabric to conform more easily and more accurately to a required complex curvature, especially a spherical, domed or hemispheroidal, or paraboloid, preferably hollow, curvature, when a curved composite article e.g. a sheet or panel is required.

See page 1, lines 20-25 of UK '041 (underlining added).

Appellants submit that this teaching of UK '041 is incompatible with the presently claimed invention. The presently claimed method includes laying different layers of unconnected threads on top of one another. It makes no sense for the Examiner to assert that one would modify UK '041 to arrive at the presently claimed invention because (i) the

presently claimed method excludes fabrics (i.e., woven fiber layers), and (ii) the layered structure of the presently claimed invention would be unable to form a curvature without completely falling apart (e.g., it would not have the draping and give characteristics described in UK '041).

Further, the Examiner relies on Curzio (U.S. 4,539,249) as support for the assertion that it would be obvious to use a thermoplastic fiber disclosed in Middleman to arrive at the presently claimed invention. However, like UK '041 above, Curzio discloses the use of such a thermoplastic thread only if the thread layers are connected with one another. Curzio discloses in the Abstract (underlining added):

Reinforced structures of graphite, fiberglass, and the like, together with thermoplastic resinous fibers such as in ribbon, filament and monofilament form are produced. The graphite fiber is combined or blended with a resinous fiber to form a single yarn. The blended yarn is then woven into a soft, subtle and flexible fabric having the appropriate concentration of graphite and resin, and with good uniform characteristics...

Here again the prior art teaching is one that requires the use of a woven fabric for its structural characteristics. Such fabrics are excluded from the presently claimed method. There is no disclosure or suggestion in Curzio that a thermoplastic fiber may be useful in a structure that is unwoven or in which different layers of threads are unconnected with one another.

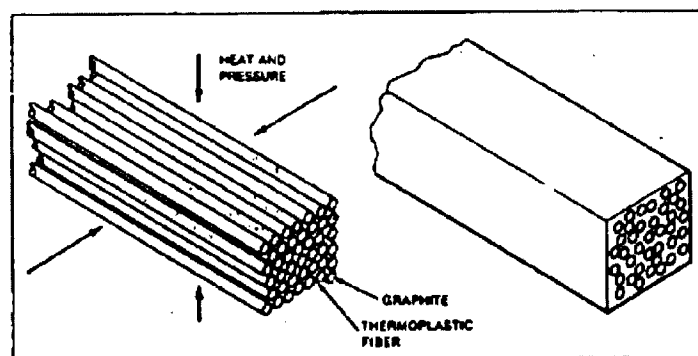
O'Connor likewise relies on the use of a woven fabric in order to provide a useful method:

Processes for preparing fiber reinforced thermoplastic articles are provided, for example, thermoplastic fibers and reinforcement fibers can be intermingled to produce a composite yarn, which is used to weave a fabric. Then the fabric heated to produce a reinforced article. As another example, thermoplastic yarn and reinforcement yarn can be woven together to produce a composite fabric, which, upon heating, produces a reinforced article.

See the Abstract of O'Connor (underlining added).

Again, the art relied on by the Examiner requires the use of a thermoplastic-containing thread that is in the form of a woven fabric. There is no disclosure or suggestion that any thermoplastic fiber disclosed in O'Connor may be used in a manner where it is not interconnected with other fibers of different layers of a fabric.

NASA Tech Brief likewise discloses a complex multilayer structure that includes threads that are present unidirectionally. The drawing of NASA Tech Brief is reproduced below to illustrate this point.



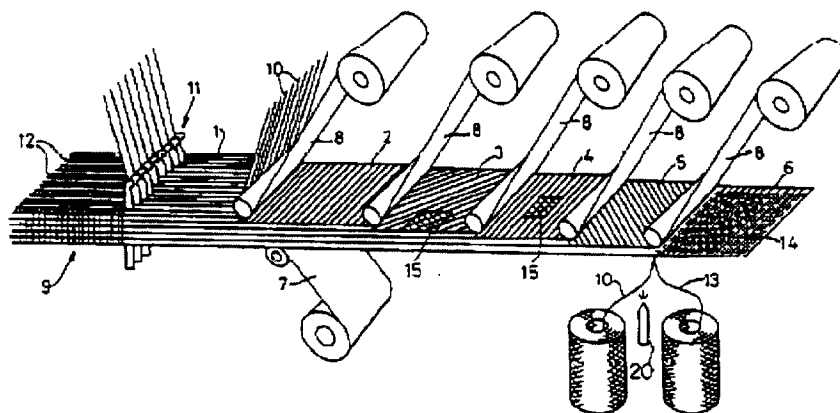
As is readily evident from the drawing, multiple layers of threads exist in the structure of the NASA Tech Brief. Not only is this structure excluded from the presently claimed invention because it includes more layers than allowed in the present claims, it is further in violation of the claimed invention because the threads are only unidirectional and thus the structure made thereby cannot meet the requirement of the present claims which recite perpendicularly oriented thread.

Matsuo (U.S. '5,989,710) likewise discloses the use of unidirectional reinforcing threads rather than a method which must produce a composite sheet having the thread structure recited in the present claims. For example, each of the examples of Matsuo provides only unidirectional thread orientation. There is no disclosure or suggestion in Matsuo that any modification of the Matsuo method is possible such that Middelman can be modified to provide a method that effectively produces the composite sheet manufactured in the presently claimed invention.

The same is true of Vane (U.S. 5,445,693). Vane may describe a process that forms a composite sheet in a continuous manner, however, Vane requires that the various thread layers are interconnected, in violation of the present claim limitations. For example:

The invention provides a method of providing a formable composite material comprising providing a reinforcing material (9) having a plurality of superimposed layers (1-6), each layer consisting of a plurality of unidirectional non-woven yarns or threads (10) laid side-by-side, the yarns or threads in at least some of the different layers extending in different directions, said layers being stitched (12) together, and before said stitching incorporating in or with the reinforcing material (9) a matrix material (7, 8).

See the Abstract of Vane and Figure 1 reproduced below.



Again, the art relied on by the Examiner discloses the formation of a composite sheet in a manner that is contradictory to the claimed invention; namely, by stitching together a plurality of fibers before such fibers undergo treatment to form a composite.

The Examiner has put forth no evidence whatsoever that one of ordinary skill in the art would in fact have been motivated to make the composite structure recited in the present claims by modifying the cited references. The Examiner appears to rely solely on the premise that: because thermoplastic fibers had previously been used in making composite structures, it would be obvious to modify the matrix impregnation method of Middelman to replace matrix impregnation with a thermoplastic fiber.

The Examiner ignores the substantial differences between the composite sheet formed in the presently claimed method and the composite sheets of the secondary references. For example, each of the secondary references uses a complex multilayered thread structure which may have interconnected threads whereas the presently claimed invention excludes such structures. The secondary references emphasize the importance of using such structures, to make use of the advantageous properties of fabrics such as draping and resilience.

Appellant submits, contrary to the Examiner's assertion, that those of ordinary skill in the art would have no expectation that modifying Middelman to substitute matrix impregnation with thermoplastic fibers would be successful in the thread structure recited in the claims. In fact, the secondary references' disclosure of the importance of the fabric-like properties of the prior art thread structures would lead one of skill in the art to believe the opposite; namely, that a method of forming a composite sheet that used only three layers of unconnected threads would not be successful because (i) the threads would not remain oriented properly during the method, (ii) the threads would have insufficient give and drape, and/or (iii) the resulting composite sheet would not be effective for any purpose.

*Arguendo*, even if the Examiner is correct that an artisan viewing the prior art as a whole would have been motivated to use a thermoplastic matrix fiber in the process of Middelman, an assertion to which Appellant disagrees, such a suggestion still falls short of the presently claimed invention because there is no basis for expecting that such a method would successfully provide a useful composite sheet in view of the contradictory disclosures of the cited art.

Therefore, as argued in the Appeal Brief of May 27, 2008, Appellant submits that the rejection is not sustainable and should be overturned.

Respectfully submitted,

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